

## Visualized Surgery

# Transoral endoscopic thyroidectomy via vestibular approach: operative steps and video

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**Abstract:** In this video we describe transoral endoscopic thyroidectomy vestibular approach (TOETVA). Inclusion criteria are (I) patients who had a ultrasonographically (US) estimated thyroid diameter not larger than 10 cm; (II) US estimated gland volume  $\leq 45$  mL; (III) nodule size  $\leq 50$  mm; (IV) a benign tumor, such as a thyroid cyst, single-nodular goiter, or multinodular goiter; (V) follicular neoplasm; (VI) papillary microcarcinoma without evidence of metastasis. The procedure is carried out through three-port technique placed at the oral vestibule, one 10-mm port for 30° endoscope and two additional 5-mm ports for dissecting and coagulating instruments. CO<sub>2</sub> insufflation pressure is set at 6 mmHg. An anterior cervical subplatysmal space is created from the oral vestibule down to the sternal notch, laterally to the sternocleidomuscles. Thyroidectomy is done fully endoscopically using conventional endoscopic instruments and intraoperative neuromonitoring (IONM).

**Keywords:** Transoral; thyroidectomy; transoral endoscopic thyroidectomy vestibular approach (TOETVA); instruments and intraoperative neuromonitoring (IONM); vestibular approach

Submitted Nov 24, 2016. Accepted for publication Dec 01, 2016.

doi: 10.21037/gs.2016.12.05

View this article at: <http://dx.doi.org/10.21037/gs.2016.12.05>

## Description of the surgical technique

Transoral endoscopic thyroidectomy vestibular approach (TOETVA) is currently multi-institutional. TOETVA was proposed, introduced and applied in different Countries as in Thailand, South Korea, India, China, Singapore, Taiwan, USA, Mexico, Japan, Ecuador and Italy (1-9). We present a case report video of TOETVA (*Figure 1*).

## Patient selection

We followed a precise inclusion criteria, i.e., (I) patients who had a ultrasonographically (US) estimated thyroid gland diameter not larger than 10 cm; (II) US estimated

thyroid volume  $\leq 45$  mL; (III) US estimated main nodule size  $\leq 50$  mm; (IV) a benign tumor, such as a thyroid cyst, single-nodular goiter, or multinodular goiter; (V) follicular neoplasm; (VI) papillary microcarcinoma of the thyroid without evidence of metastasis (1-9).

Exclusion criteria comprised patients who (I) were unfit for surgery; (II) could not tolerate general anesthesia; (III) previous radiation in the area of the head, neck and/or upper mediastinum; (IV) had previous neck surgery; (V) recurrent goiter; (VI) thyroid volume  $> 45$  mL; (VII) dominant nodule size  $> 50$  mm; (VIII) evidence of lymph node or distant metastases; (i) tracheal/esophageal invasion; (ii) recurrent laryngeal nerve (RLN) palsy (m) biochemical or ultrasound



**Figure 1** The video shows transoral endoscopic thyroidectomy vestibular approach (TOETVA). The procedure is carried out through three-port technique placed at the oral vestibule, one 10-mm port for 30° endoscope and two additional 5-mm ports for dissecting and coagulating instruments. CO<sub>2</sub> insufflation pressure is set at 6 mmHg. An anterior cervical subplatysmal space is created from the oral vestibule down to the sternal notch, laterally to the sternocleidomuscles. Thyroidectomy is done fully endoscopically using conventional endoscopic instruments and intraoperative neuromonitoring (10).

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signs of hyperthyroidism and (n) oral abscesses (1-9).

## Operative technique

TOETVA is performed under general anesthesia with naso- or orotracheal intubation with EMG tube (Trivantage EMG tube, Medtronic, Jacksonville, Florida, USA). The endotracheal tube is fixed at the left or right corner of the mouth and equipment for anesthesia is set up on the same side of the patient.

The patients are in a supine position with slight neck extension created by a pillow placed under the shoulders and in a 15° Trendelenburg bed position. The bed is lowered at the height of the first operator, as in a laparoscopic procedure.

The operative room setting includes the surgeon is standing at a position near the patient's head, first assistant on the left, nurse on the right and HD monitor and intraoperative neuromonitoring (IONM) at patients foot.

Amoxicillin/clavulanic acid is used for preoperative prophylactic antibiotic (1). All patients underwent dental care about 1-3 months before surgery (1-9). Pre-operatively, patients are asked to gargle with Chlorhexidine mouth wash.

Eyes and nose are draped by gauzes and Tegaderm film roll (3M Company, Saint Paul, MN, USA) providing protection and surgical field is prepared.

The oral cavity is disinfected using 0.05% Hibitane in water for 5 minutes (1).

Surgical instruments prepared by the nurse comprehend: standard neck tray, Verress needle for hydrodissection, straight vascular space creating tunneler probes, Kelly clamp, one 10 mm trocar, two 5 mm trocar, 30° 10 or 5 mm scope, ball tip stimulator probe for IONM 230 mm long (Medtronic, Jacksonville, Florida, USA), conventional endoscopic instruments as Maryland dissector, tissue grasper, needle holder, vascular clips (Hem-o-lock, Teleflex, Morrisville, USA), energy based device (EBD), suction and endobag (2).

All TOETVA procedures are offered with IONM.

Hydrodissection is first performed with a 30 mL solution of 1 mg adrenaline diluted with 500 mL normal saline injected sub-platysma into the oral vestibular area of the lower lip down to the anterior neck and central working space (1-9).

The first 10 mm incision is made at the center of the oral vestibule, with a subsequent space created passing the mandibular area and submental space to the anterior neck and spread laterally using an electrical scalpel and Kelly clamp forceps (1). A blunt-tipped 10-mm trocar is inserted for a 10 mm 30° laparoscope (8). The CO<sub>2</sub> insufflation pressure is set at 6 mmHg. Two 5 mm trocars were inserted at the junction between the incisor and canine on both sides pointing down to the anterior neck under direct endoscopic vision (1).

EBD, prograsp, Maryland forceps are inserted through the 5 mm ports.

The working space was created beneath the subplatysmal layer via oral vestibule, through premandibular space by using straight vascular tunneler, low pressure CO<sub>2</sub> gas insufflation (6 mmHg) and EBD (1).

Superior border is the larynx, inferior border is the suprasternal notch, and lateral borders were the anterior and medial borders of both sternocleidomastoid muscles (1). Laterally, both for lobectomy and bilateral procedure, the dissection is continued up to the medial border of the sternocleidomastoid muscle on both sides.

The whole procedure and operator's view are cranio-caudal.

EBD is used for creating the working space and the dissection and division of tissue and vessels. An external hanging central neck suture for retraction is routinely applied.

Thus, the working space is created and maintained by

mechanical lifting and CO<sub>2</sub> insufflation, which provides an excellent endoscopic view during the operation.

Strap muscles are divided and retracted by cutting midline linea Alba cervicalis and deep fascia. For better exposure, strap muscles are retracted laterally by external hanging suture. Thyroid isthmus is identified, dissected and separated. The middle thyroid vein, superior thyroid artery, and vein are ligated as close to the thyroid as possible.

During upper pole dissection the external branch of the superior laryngeal nerve (EBSLN) is preserved (1).

The upper pole of the gland is lifted up and we could easily identify the RLN, as its insertion to the larynx lies downwards parallel to the trachea in the tracheoesophageal groove. RLN exposure and dissection of the nerve is cranio-to caudal.

Cutting this artery and vein should be performed close to the gland, with subsequent removal of the rest of Berry's ligament. Berry ligament is carefully divided while avoiding damage to the recurrent nerve. All parathyroid glands are identified and preserved. The specimen was removed using an endobag via the 10-mm incision and sent for pathology.

After complete removal of the thyroid, the operative field is irrigated with saline, and meticulous hemostasis is achieved. Contralateral thyroidectomy is accomplished only if the RLN EMG signal of first side is preserved (1-9). If surgical drain is required, this is placed by adding a 5-mm incision into the axilla and tunnelled up to neck; correct placement of drain is guarantee by endoscopic view. Strap muscles are not re-approximated. The oral vestibule surgical wound is closed using running 4.0 absorbable sutures. No dressing is required. Oral antibiotics and mouthwash 3 times per day are prescribed for 5-7 days. All patients started an oral diet on day 0 postoperatively, evening. Patients are mobilized from bad at +4 hrs postoperatively. Patients can take a shower and mans has the evening. Patients can sunbathe on the following weekend. Discharges from hospital are dictated by the common rules of the thyroid surgery, after careful evaluation by the surgeon, endocrinological and anesthesiological specialist, serum calcium dosage and after neck, mouth and laryngoscopy evaluation.

## Acknowledgements

None.

## Footnote

*Conflicts of Interest:* The authors have no conflicts of interest

to declare.

*Informed Consent:* Written informed consent was obtained from the patient for publication of this manuscript and any accompanying images.

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**Cite this article as:** Dionigi G, Bacuzzi A, Lavazza M, Inversini D, Pappalardo V, Boni L, Rausei S, Barczynski M, Tufano RP, Kim HY, Anuwong A. Transoral endoscopic thyroidectomy via vestibular approach: operative steps and video. *Gland Surg* 2016;5(6):625-627. doi: 10.21037/gs.2016.12.05